1. Introduction

During the civil war in Somalia after 1988 and the subsequent fall of the central government of Somalia, Somaliland has restored its' independence on May 18, 1991 in Buroa. Somaliland has declared that it is not part of Somalia any More. A peace Process started after May 1991 to form region of stability within the Colonial borders of ''British Somaliland Protectorate'' The Republic of Somaliland put up functioning government institutions such as a national Parliament, Courts. Police force, etc. Today Somaliland is a democratic, functioning state which is able to control peace and security within it 's' border's Tasks within the responsibility of a central government have been taken up by the ministries and the autonomous agencies and made sustainable development.

The only means of transport to sustain the Somaliland is by road. Traditional Commercial trade has always been the back bones of the Somaliland economy, in particular the export of livestock (3 million herds per year) and other commodities, traded against goods which are not available in the country. Since a major asset for a trade based economy is port. Barbara port is the core of the economic development of the region.

The Somaliland Road Development Agency (SRDA) cannot afford all the needs of Somaliland core road network but with the limited Road Fund the priority has always given the rehabilitation and maintenance of Berbera corridor road of which still cannot cover.

Figure1. Berbera Port

1.1 Background

The paved road between Hargeisa and Barbara (153 Kms) was constructed in 1975 with a design life of 10 years, and the road between Hargeisa and kalabayd (68 Kms) was constructed in 1982 with a design life of 10 years. It should thus be noted that the life span of Berbera Corridor paved roads has been surpassed with almost above 40 and 33Years respectively.

The road between Kalabayd and Togwaajale (20 Kms) was constructed in 2001in Gravel condition. The road passes through an area of black cotton soil which is completely farming area. This road has been upgraded to Double Surface Treatment three years ago in 2013 by SRDA. The total length of Berbera Corridor from Barbera to Togwaajale is **253** Kms.

With the implementation of the agreed minutes of meeting signed Between Maritime Affairs Authority under Minister of Transport of FDRE and Berbera Port authority of Somaliland on March 28-31, 2016 Particularly the articles concerning the road sector, on the dates of june 23 to july 02, 2016 an Ethiopian Roads Authorities (ERA) a member of JOC made a visit to roads:

- Hargeisa - Bebera paved road.
- Hargeisa city bypass.
- Hargeisa - Kalabayd paved road.
- Kalabayd - Togwachale paved road.
- Togwachale town unpaved road

I studied carefully the condition of roads and structures and agreed to focus urgent maintenance and rehabilitation of Berbera corridor road which is the most important corridor in Somaliland because it's the backbone for the economy of the country and the trade between Somaliland and Ethiopia.

The average existed carriage width of the paved roads is between **5** m to **6.5m** which says to be very narrow and shoulders are 1-1.5m wide on each side. Most of the original surfacing about 96km out of 253 total road which **38%** is worn-out since the binder of the double seal is over passed the allowable time and has lost its flexibility and water proofing ability especially about 20km from Abarso Town to Hargesa Town and 76 km from Hargeisa - Berbera. This results a quick development of potholes in the pavement under the weight of truck axels. The quick deterioration of the road surface is therefore a main concern.

The structures RCC Irish- crossing, RCC box culverts and pipe culverts of the Berbera corridor road are almost intact but they need some emergency repairs.
The east-west traffic presently follows the main road in the centre of the city where congestion occurs with the increase of the number of vehicles. The Somaliland Roads Development Agency and its Municipality office has made the design and cost estimates and now is under construction of 20 Km gravel road by pass (ring road) located in the north of the city including some structures within the short term plan.

1.2 Present Situations

Since Ethiopia became a landlocked country and access to a deep- sea became a major issue for its foreign trade (Export/Import) and for the provision of food aid.

The government of Ethiopia has therefore decided to secure as many routes to access seaports as possible. The Berbera port is one of the important ports for Ethiopia and Somaliland also.

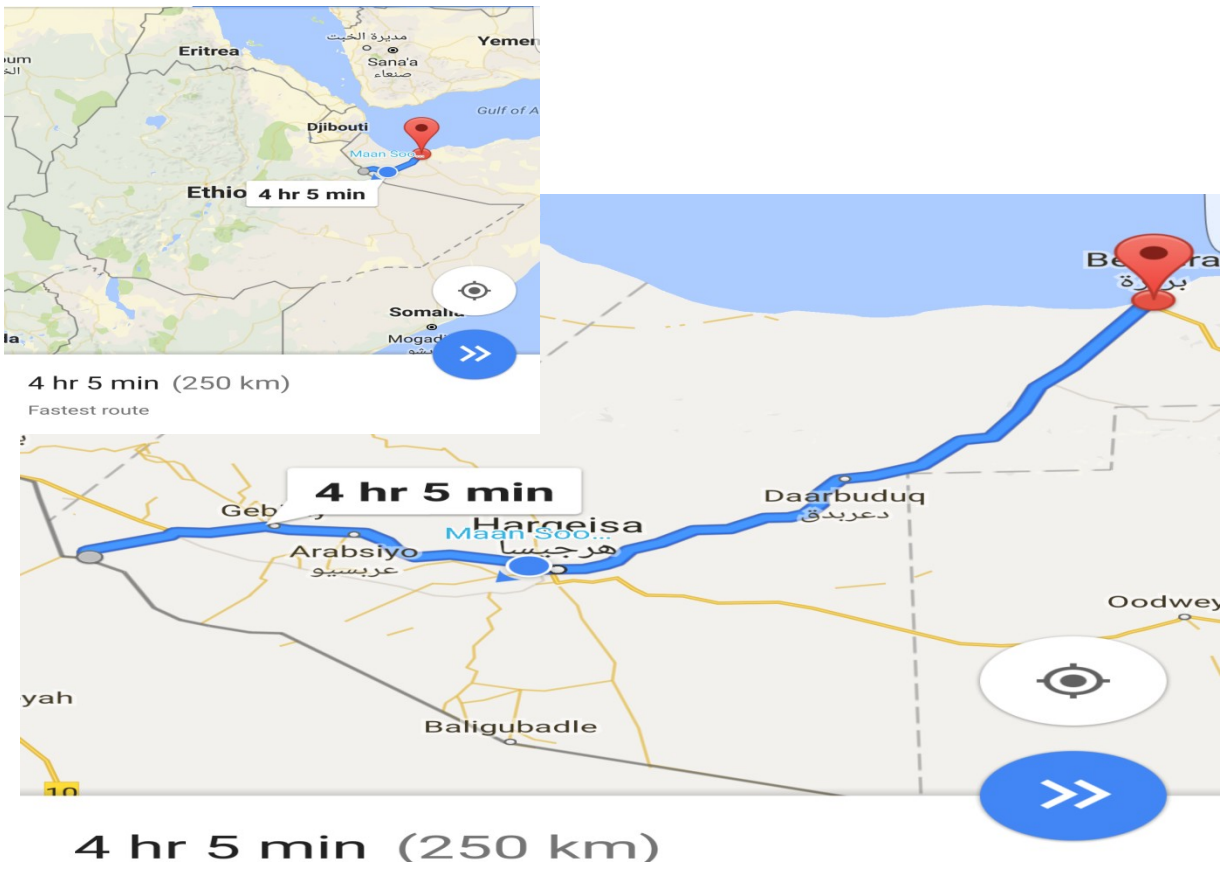
Now days the relationship between Ethiopia and Somaliland is in a very good condition and Ethiopia is the major trading partners on the import side. The Ethiopian government is therefore anxious to use the Berbera port.

The Berbera Corridor, the main road from Berbera port through the capital of Somaliland; Hargeisa to the Ethiopian border is a vital importance not only for Somaliland but also for Ethiopia. Ethiopia uses Berbera port for its' Commercial goods starting on January 2006. Commercial traffic rates are also growing with constantly expanding trade form Berbera to Ethiopia.

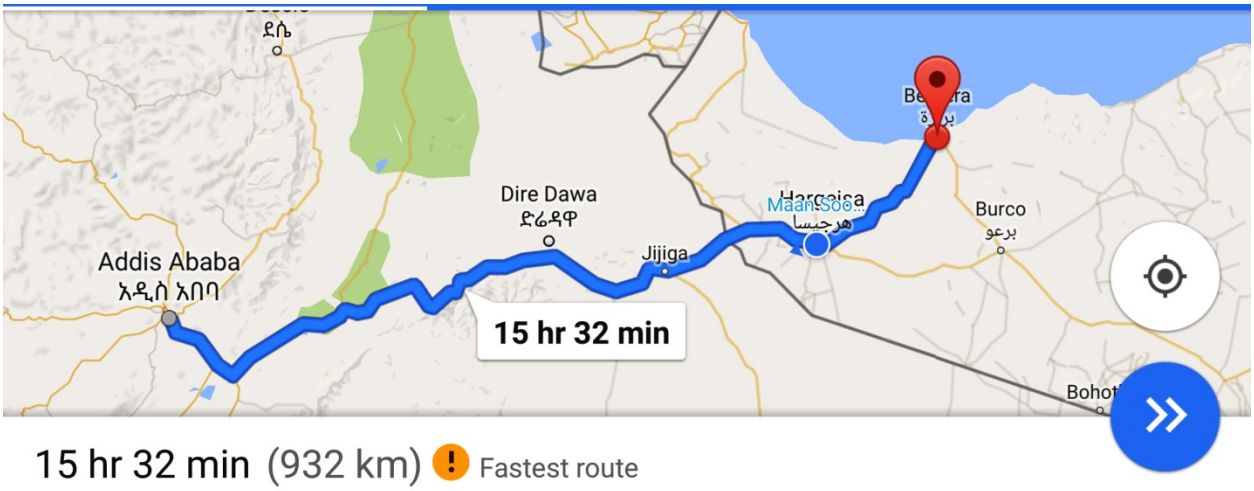
The road linked Berbera and Addis Ababa has a total length of about **932** Km out of it 253 Kms are within Somaliland territory and 679 Kms is within Ethiopia. This rout is the **3rd** shortest link next to Assab and Djibouti, which is 882 Kms and 909 Kms respectively. The potential transport demand on the Berbera corridor could be divided into the regional trade between the Somali region of Ethiopia which is clearly located in the hinterland of the Berbera port and the transit of the Ethiopian foreign trade with third countries including food aid.

1.3 Location map

Tog wajaale- Berbera about 250km



Addis Ababa- Berbera 932 km long



2 Objective of the Assessment

As per the agreed minutes of meeting signed Between Maritime Affairs Authority under Minister of Transport of FDRE and Berbera Port authority of Somaliland on March 28-31, 2016 (refer appendix) on issues of common concern and how best the use of the Berbera port can be revitalized. A technical expert from Ethiopia side has taken responsibility to study the site Jointly in order to suggest solutions for a possible rehabilitation of the road in Berbera corridor.

The overall objective of this proposal is to make the Berbera Corridor fully operational, Smooth. Safe and efficient road traffic with international standard, which can bear the Ethiopian heavy trucks that uses the Corridor at the moment.

A technical expert from Ethiopian side traveled to Hargeisa on 22th of June 2016 and carried out road assessment from June 23 to July 02, 2016 with supports of Somaliland

A technical expert was;

Samson Tesfaye Dire Dawa Road Network Directorate Director, E.R.A

The expert traveled from Hargeisa to Berbera, Hargeisa bypass, Hargeisa to Kalabayd. Kalabayd to Togwajaale road segments and observed the existing condition of the asphalt and Togwajaale town Gravel road. The expert identified the type of intervention needed. The workload (quantity) and the Budget required maintaining the road corridor for short term and proposing for medium and Long Term plan. The expert also assessed the availability of construction Materials. The security and Working conditions along the road Stretch.

3. Road Condition of the Road Corridor

3.1 Togwachale Town Section Road

The Togwajaale town section gravel road is approximately 2 Km length. This is the only road which is unpaved other than Hargeisa bypass alternative road. The stretch traverses a flat area on a curved alignment. This gravel road was not maintained in recent years and is deteriorated so that it is difficult to travel on it due to lack of regular and proper maintenance. The existing Traffic uses the diversion road.

For short term plan the road requires Periodic maintenance intervention and then regular light maintenances and follows up. For medium term plan the road should be upgraded to Double surface treatment standard.

The main activities to be carried out in a sort term plan for this 2km road are:

1) Road bed preparation

2) Embankment works (fill)

3) Gravel resurfacing and other day works

4) Double Surface Treatment, if possible in order to minimize frequent maintenance cost this medium term maintenance activity has to be done in short term.

The required quantity and the necessary amount for short term plan (periodic Maintenance) is calculated and presented in the appendix

Figure2. Togwajaale Town section gravel Road around 2km length

3.2 Togwachale – Kalabayd Road

The Togwachale- Kalabaid Asphalt (DBST) road is approximately 20 Km length. The stretch traverses a very flat area on a straight alignment. This road was upgraded before 3 years in 2013 by SRDA. It is in a good condition except availability of 1 spot per 4km with 0.5m width which is insignificant. Since the sub grade material is black cotton there is a sign of settlement in some portion of the stretch which may require base failure maintenance in recent.

For short term plan the road did not requires major maintenance intervention except safety works and follows up. For long term plan the road should be upgraded to Asphalt Concrete standard due to low baring capacity of the pavement as well as weak soil sub grade.

The main activities to be carried out in a sort term plan are:

1) Pothole reinstatement (minor only 5 spots are created in whole 20km stretch)

2) Gabion protection in few areas where floods tries to Crosse since the road has no proper drainage crossing design

3) Safety works and other day works

The required quantity and the necessary amount for short term plan is calculated and presented in the appendix.

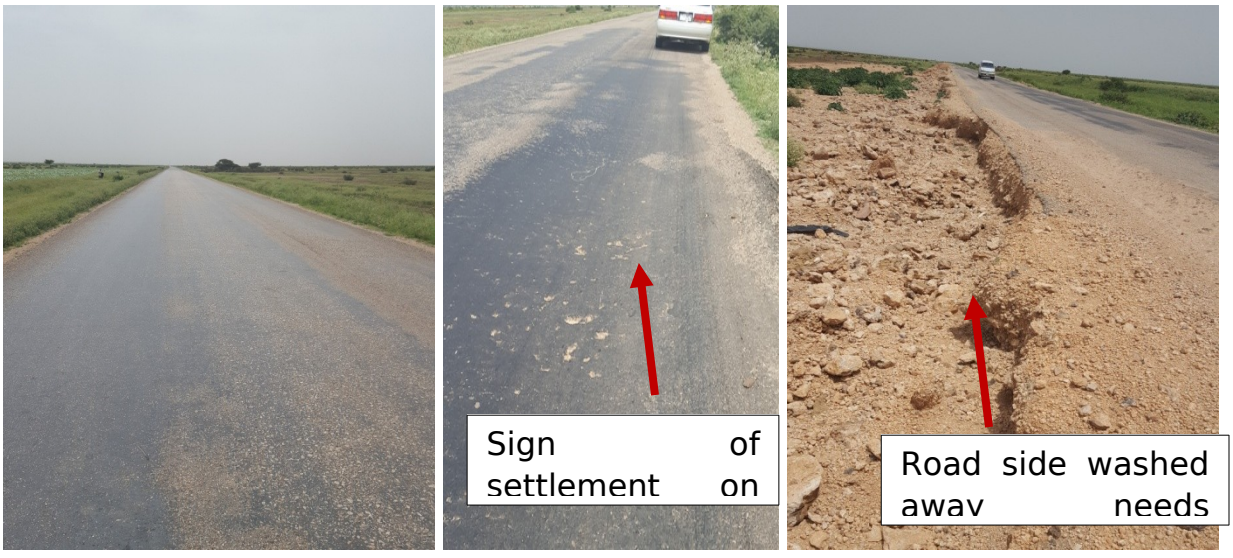


Figure3. Representative road from Togwajaale - Kalabayd

3.3 Kalabayd –Hargeisa Road

The Kalabayd –Hargeisa road was built in the late 1970's early 80's by two different contractors: a Chinese contractor built the first 12 Km after and an Italian contractor built the remaining 53 Km and total length is 68km. Many culvers and few other structures (fords. Retaining walls, gabions) destroyed during the war or threatened by erosion were rebuilt in 2000.

This road is in fair condition has a narrow width of 5 to 6.5m with 1-1.5 width shoulder and most of the original surface is exhausted since the binder of the double seal is from 20 to 30 years old and has lost flexibility and water proofing ability. This results in a quick development of potholes in the original Pavement due to heavy loaded Trucks. The condition of the road has heavily deteriorated especially from Abarso town to Hargeisa (about 20km) due to the absence of maintenance, Heavy rain and heavy volume of traffic. During assessment i identified that the road has being narrowed due to shoulder damage, availability of many potholes and edge damage as well as trees and bushes.

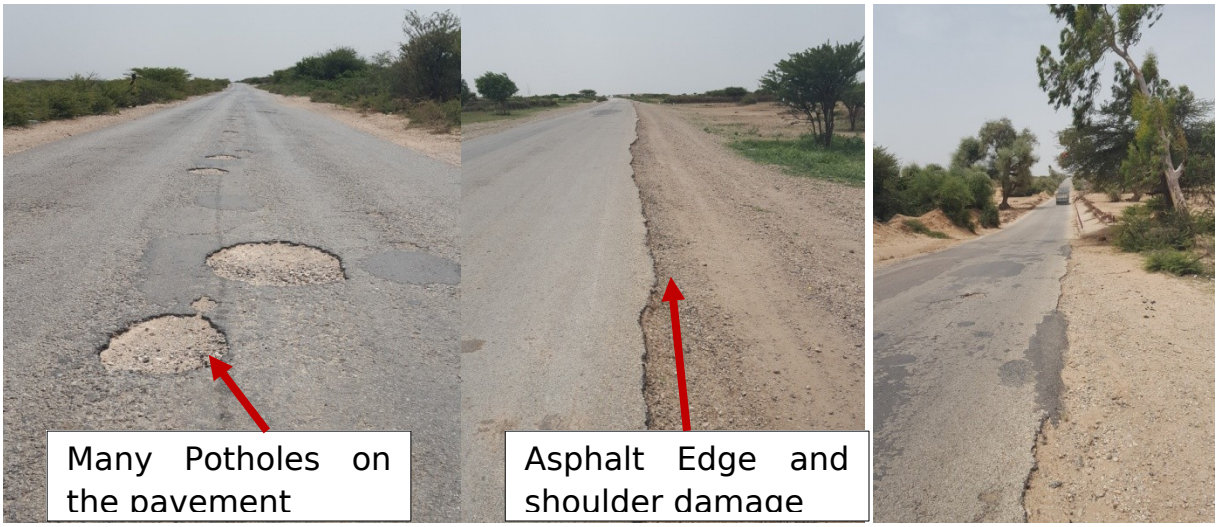


Figure4. Representative road from Kalabayd – Hargesa 68km in length

The main activities to be carried out to make the road serviceable in the short-term plan are;

1) patching
2) Mix in place overlay (DBST)
3) Shoulder rehabilitation
4) Tree and Bush clearing
5) Edge repair (DBST)
6) Masonry construction (retaining wall)
7) Gabion Structure
8) Side drains clearing and construction of dykes in water crossings

In the short- term plan the defects like potholes, Edge damage, Shoulder rehabilitation cracking, raveling, bush clearing, scouring etc should be repaired and maintained.

In the long plan this road should be upgraded to Asphalt Concrete with widening operation and proper crossing drainage design since the exiting road is worn double surface treatment, has a narrow width of 5-6.5m which cannot accommodate two vehicles aside and cannot carry heavy traffics. And requires three long Bridges at three stations 33+000 (80m span) ,36+700(96m span) and at 40+000(128m span) mostly creates traffic jam for several hours during rainy season where floods are occurred.

Figure5. Bridge required at station 40+000(128m span) from Hargeisa

Figure6. Bridge required at station 36+700 (96m span) from Hargeisa

Figure7. Bridge required at station 33+000 (80m span) from Hargeisa

3.4 Hargeisa City Diversion Road (by Pass)

The specific problem of the transit through the city of the Hargeisa by the Berbera Kalbayd Togwachale (Ethiopia border), which is the main artery of the city .is linked to the general organization of the traffic in the city .Due to high traffic the road in Hargeisa town heavy tracks unable to cross the town in daytime Instead the heavy tracks should spend (waste the time) daytime in town and pass after 11pm. An alternative road alignment that could be considered to reduce traffic congestion in the city center is very necessary. Therefore construction of bypass would be the most advantageous for the transit traffic and to reduce the traffic jam and accident in the town.

Figure8.Traffic conjunction at Hargeisa Town and symbol of the town NASAHABLOT in Somaliland language having meaning of Female breast

The Hargeisa by pass is approximately 20 km and the Somaliland side that they will construct the bypass themselves within short time and have been started a month ago as the towns Ring Road.

The construction of bypass gravel road is a short –term plan whereas the upgrading to DBST is medium term plan and to Asphalt Concrete is for long-term plan

Figure9. Working in progress at Hargeisa bypass

In my visit there was no surveying work done, no surveyors, I could not get the alignment design (the site engineer could not be volunteer to disclose the work progress). I think the Ring road /bypass about 20km road would not have proper design and man power deployment as well as machinery. Checking whether the under construction road could complies the standard road requirement of DS-5 is necessary and any support required from Ethiopia.

3.5 Hargeisa - Berbera Road

A Lebanese contractor built the total stretch length 156km Long including 13 km Hargeisa town Trunk road between Hargeisa and Berbera in the early 1970 S. This road is double surface treatment having width 5-6.5m and 1-1.2m shoulder and within the first 97km and the last 7km are (about 76km) is in bad conditions, most of the original surface is exhausted since the binder of the double seal is above 30 years old and has lost flexibility and water proofing ability. This results in quick development of potholes in the original pavement due to heavy loaded trucks. However, from Hamas town about **40**km from 97km-136.2km is newly upgraded over layed by Asphalt Concrete with thickness of 4 cm having width of 6.5m by AMAL J.V Civil engineering Contractors Company and is in a very good condition except having lots of drifts and sags.

The condition of the road for rest portions (about 76km) has been deteriorated due to the absence of maintenance, Heavy rain and volume of traffic for a long time.

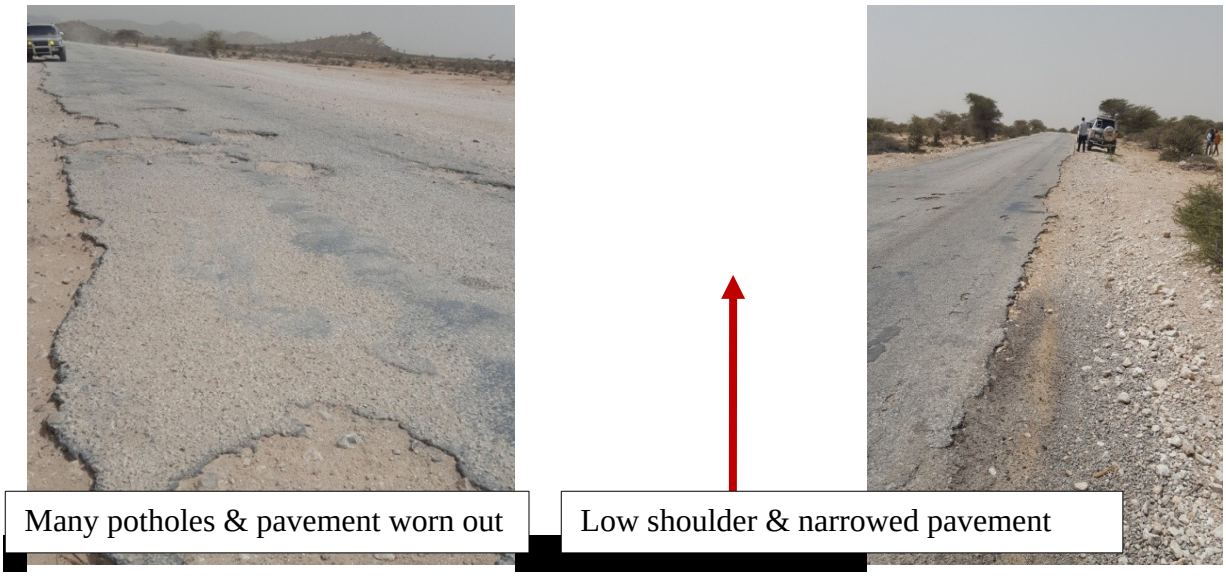


Figure10. Shows representative section for the deteriorated portion Hargeisa towards Berbera

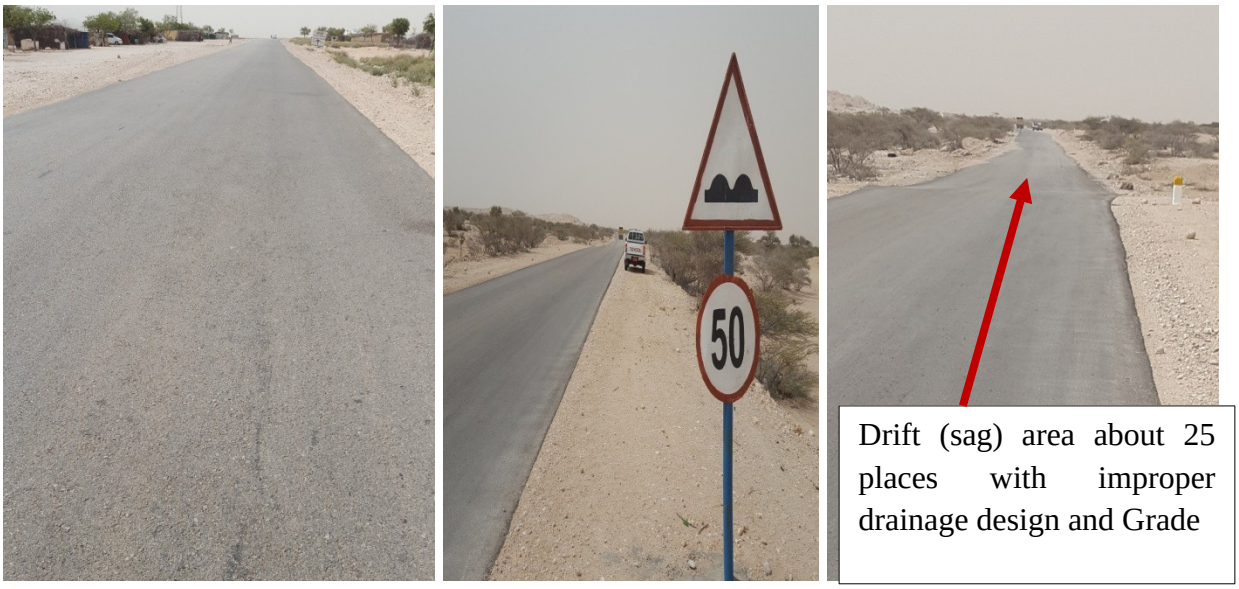


Figure11. Representative section for the newly overlayed 40km Hamas towards Berbera.

There are about 25 drift areas (as shown in the above right side figure) having created sag which is uncomfortable to long vehicles as well as crating problems on the serviceability of the road during rainy season.

Its Fords characterize the road between Hageisa and Berbrera. There are no big Bridge structures on the road, but numerous 7.50m wide Fords (Irish crossing) were built. Several box culverts: Armco steel pipes and concrete pipe culverts exist. Regular over topping of the road is recorded at several locations in rainy season the Fords are being blocking by silt and debris and the traffic may interrupt for long period of time unless stand by Dozer and Loader assigned

Figure12. Representative for Water crossing points which needs Bridges and protection work.

It is also necessary to construct many dikes and retaining wells on not observe along the stretch. The main activities needed to carry out in the short –term plan are:

1) Pothole patching
2) Over laying
3) Edge repairing
4) Shoulder rehabilitation
5) Dike (secondary ditch) construction
6) Retaining wall
7) Side ditch construction
8) Gabion construction

The quantity and the budget required to maintain to road in short period of time is calculated and presented the appendix

In the long plan this road should be upgraded to Asphalt Concrete as of the Hargeisa-Kalabayd road with widening operation and proper crossing drainage design since the exiting road is worn double surface treatment, has a narrow width of 5-6.5m which cannot accommodate two vehicles aside and cannot carry heavy traffics. And requires Ten long Bridges at ten stations 17+000 (90m span) ,28+800(30m span) ,37+000(50m span) ,53+600(110m span), 63+500(30m span), 75+400(80m span), 75+600(350m span), 83+200(6m span), 89+000(400m span) and at 106+200(300m span) mostly creates traffic jam for several hours during rainy season where floods are occurred. Moreover, there are about 25 drift areas having created sag which is uncomfortable for long vehicles as well as crating problems on the serviceability of the road during rainy season

3.6 Traffic signs for Berbera corridor Road

The team has identified the traffic sign items to be installed as the soonest time possible. The Somaliland side also provided the posts and traffic signs. The type and quantity of traffic signs required is attached as appendix

4. Topography, traffic flow and climate

4.1 Topography

The road corridor traverses flat, Rolling and less mountainous. The rout falls under mainly plain (flat) terrain.

4.2 Climate

The day temperature Togwachale is around 30^0 to 35^0 c.the night goes down to average 20^0 c. the road corridor comes under hot and semiarid zone. In Berbera it reaches up to 45^0 c. In Somaliland the average daily temperature range from 25 ^{0} c to 35 ^{0} c the sun passes vertically overhead twice a year on 22nd March and 23rd September Somaliland consists of three geographic zones called 1) the coastal plain 2) the coastal range 3) the plateau

4.3 Rainfall

In Somaliland there are four recognized seasons in the year defined by rainfall patterns. These are called winter, spring, summer and autumn. The average annual rainfall is 500 mm in the coastal range and the plateau and 100 mm in the coastal plain. The rain season around Hargeisa and Berbera are from April to September. The mean annual rainfalls in Togwachale is 276- 450 mm

4.4. Annual average daily traffic (AADT)

The annual average daily traffic (AADT) of the road corridor is described in the table below

No	Description of the road corridor	AADT (2015 count)	Remark
1	**Togwachale-Kalabaid Road**	**487**	
2	**Kalabaid – Hargeisa Road**	**1295**	
3	**Hargeisa-Berbera Road**	**929**	

Table1. Annual average daily traffic

5. Road Maintenance Strategy and Recommendations

5.1 Short term maintenance plan

In a short-term plan all the identified defects along the road corridor should be repaired and maintained in a short period of time in order to make the road corridor passable and secured for smooth flow of traffic,

- The unpaved road of Togwajaale town about 2km requires Scarifying, re-graveling, DBST Surfacing(optional may be done in medium term plan however, in order to reduce frequent maintenance for the gravel wearing course it is better to include in short term)
- The paved road from Togwajaale – Kalabayd 20km length road requires only Gabion construction in some places and road furniture work.
- The paved road between Kalabayd and Hargeisa require immediate solutions such as pothole patching, overlaying by AC or DBST in selected portions, edge repairing, and shoulder backfilling(rehabilitation), rescaling of some sections, construction of dykes and repairing of structures has to given priority.
- The paved road between Hargeisa- Berbera Port require an urgent program such as pothole patching, overlaying by AC or DBST in selected portions, edge damage repairing, and shoulder backfilling(rehabilitation), rescaling of some sections, construction of dykes and repairing of structures has to given priority.
- The construction of Hargeisa By-pass as a gravel road including structures is also given priority.
- Installation of road signs on the positions identified by SRDA. The cost estimates and drawing in the short term are based on the data collected by ERA engineer and SRDA as per appendix A & B. however, the quantity by SRDA is very less which only can cover small portion of road stretch and does not make the road to serviceable standard.

Table2. Below shows summary of short term plan

Item no	Road Segment name	Defect type	Impact on road user	Remedial measure required	Estimated maintenance cost $Dollar
1	Togwajaale town (2km gravel)	✓ Potholes, ✓ deformation, ✓ settlement	✓ Forced to drive off road ✓ Uncomforted drive ✓ Vehicular damage	1) Road bed preparation 2) Embankment works (fill) 3)Gravel resurfacing and other day works	506,241.25

				4)DBST	
2	Togwajaale-Kalabayd (20km DBST)	✓ Few minor Potholes, ✓ Road side scoured ✓ Few Settlement	✓ Unnecessary shifting allignment	1. patching 2. Gabion 3. Road signs	
3	Kalabayd – Hargeisa (68km DBST)	✓ shoulder damage ✓ potholes ✓ edge damage ✓ trees and bushes ✓ narrowness (5-6.5m) of width of road ✓ cracking, raveling ✓ No road signs and guide posts.	✓ Cannot accommodate two vehicles sideways ✓ Over taking is difficult and risky ✓ Unnecessary shifting alignment to off road which is prone to accident	1.patching 2. Edge repair 3.Mix in place overlay(DBST) 4.Shoulder rehabilitation 5.Tree & Bush clearing 6. dykes &signs	2,591,106.4
4	Hargeisa town- (15km DBST)	✓ Crowed road from morning until 11pm	✓ Heavy traffic jam and congestions ✓ Difficult to pass the town until 11pm	Hargeisa By-pass (20km gravel)	5,400,843.4
5	Hargeisa-Berbera Port(143km DBST,AC overlayed)	✓ shoulder damage ✓ potholes ✓ edge damage ✓ trees and bushes ✓ narrowness of width ✓ cracking, raveling ✓ Noroad signs and guid ✓ Silt and no crossings	✓ Cannot accommodate two vehicles sideways ✓ Over taking is difficult and risky ✓ Unnecessary shifting alignment to off road which is prone to accident ✓ Traffic jam during raining season	1.patching 2. Edge repair 3.Mix in place overlay(DBST) 4.Shoulder rehabilitation 5. Bush clearing 6.dykes &signs	3,735,034.9
Road furniture's					1,431,750
Rehabilitation Supervision fee					2,693,691.0
Total maintenance cost for short term including 15%VAT and 10% contingency $Dollar					**16,358,667**

5.2 Medium Term Rehabilitation Plan

For Medium-term plan the road corridor should be upgraded by overlaying with Asphalt concrete in some abandoned and highly deteriorated sections including shoulder widening since

the exiting road is not accessible for two heavy vehicles travelling in different direction as well as for overtaking and also have worn double surface treatment and cannot carry heavy traffics passing on it.

- The paved road between kalabayd, and Berbera requires a complete rehabilitation such as strengthening by overlaying by Asphalt concrete and widening of the carriage way.
- Construction of small crossing structures and bridges is mandatory.
- Upgrading the Hargeisa by pass gravel road in to Asphalt Concrete Standard
- Upgrading of Togochale town gravel road in to Asphalt Concrete.
- Upgrading of Kalbayd - Togwachale DBST Road in to Asphalt concrete by overlaying

Hence, I **recommend** the medium term plan has not been feasible (further asset life cycle management analysis shall be done) if long term plan would be applied in few years because the road requires completely reconstruction as a result of many problems mentioned in short term plan and condition survey assessment. It simply do minor crossing structure construction, following up of the road condition and regular maintenance until reconstruction work starts to implement.

5.3 Long Term Reconstruction Plan

For long-term plan the road corridor should be upgraded to Asphalt concrete considering ,well designed road grade standards, many Bridges and crossing structures and keeping standard width of the road (pavement width widening) since the exiting road is weak double surface treatment and cannot carry heavy traffics for longer passing on it.

- Many Bridges (more than 15 in number and span length 6-350 m) and crossing structures(more than 30 drift areas) has to be designed for construction and widening of the carriage way.
- Since most section of the road is built at natural grade level, well design vertical profile grade is required.
- To follow up the E.U project proposal carried out by JBG Gauff Ingenieure in 2014 concerning a complete rehabilitation of the corridor.
- The base for Kalabayd - Togwaaale road is black cotton and has sign of settlement on the new DBST Surfaced so as to be reconstructed by standard of Asphalt concrete.

In the long term the cost estimates will be referred the E.U report of feasibility study by JBG Gauff Ingenieure of the corridor in 2014.

Table3. Below shows summary of long term plan

Iten no	Project segment name	Surface type	Length(km)	Upgrading cost estimate(**$ Dollar)**
1	Berbera - Dacarbuduqh	AC	90.9	84,500,000.00
2	Dacarbuduqh-Hargeisa East	AC	61.1	49,500,000.00
3	Hargeisa East- Hargeisa West	AC	15.7	24,400,000.00
4	Hargeisa West-Kalabaydh	AC	62.8	58,900,000.00
5	Kalabaydh- Togwajaale	AC	19.2	35,000,000.00
6	Hargeisa bypass	AC	18.1	23,000,000.00
TOTAL			**268.2**	**275,500,000.00**

Source; JBG Gauff Ingenieure Design consultants cost estimate of the corridor in 2014

Note that; the total amount is inclusive of 57,700,000.00 $ as contingency

5.4 Financial Source Proposal for Maintenance budget (Budgeting Options)

It is believed to have four options (suggestions) to get finance for short –term road maintenance

1) Form the donor source (EU or others)
2) From Somaliland side As per article 26 of the agreement
3) From Ethiopian side:- Ethiopian side rehabilitate (maintain) the road itself and then deduct (reimburse) the whole amount from the future port service as per the payment certificate .But this option requires an agreement between the two countries. As per article 26 of the agreement gives option for agreement
4) To share the maintenance cost of the road by the two countries (Somaliland &Ethiopia) under the terms to the agreed. As per article 27 it says to maintain good road link the parties shall strive to consistitue the joint road fund

6. Work Load and maintenance cost estimation

The workload and maintenance cost estimate for the short-term plan is calculated in two options

6.1 Using Ethiopian Recourses (Machinery, Construction Material and Manpower) (See Appendix A)

6.2 Using Somaliland Recourses (Machinery, Construction Material and Manpower) (Appendix B) however, the quantity by SRDA is very less which only can cover small portion of road stretch and does not make the road to serviceable standard.

6.3. Quarry Site and Material Source

There is plenty of borrow material, Sub-base materials, masonry stone and sand source for road maintenance within the road length from Togwajaale – Kalabayd – Berbera. See appendix

7. Security Problem and Working Conditions

The Somaliland team information and observation of mine that there is no security problem along the road corridor and the Somali side believed that there is sustainable peace and working condition. During maintenance the Somaliland side can give full cover and facilitate everything for Ethiopian workers and it would be easy to cross the border of two countries. But during my assessment there was many check points and some of the supervisors shows misbehave and I informed to reduce the unnecessary checks in to two according to the agreement article 24 and to act in a good manner.

8. Appendixes

A - Cost estimation using Ethiopian Resources

B - Cost estimation using Somaliland Work load and Resources (based on their assessment and estimate)